NOTES, ABSTRACTS, AND REVIEWS.

DEATH OF PROF. FRANK WALDO.

Prof. Frank Waldo, meteorologist and educational expert, died at his home in Boston, Mass., on May 7, 1920. Prof. Waldo was born at Cincinnati, Ohio, November 4, 1857, and graduated from Harvard University in 1884. He was employed as computer and professor in the meteorological branch of the U. S. Signal Corps from 1881 to 1887, and as special agent of the U. S. Weather Bureau in 1890. He was engaged in cattle ranching 1896–1902; editorial work, 1902–1907; was employed as an expert in industrial education by the Massachusetts Commission on Industrial Education, 1907–1911; was a member of the Austrian and German meteorological and philosophical societies and of the National Society for the Promotion of Industrial Education; also of the Authors and Century clubs of Boston. Was the author of Modern Meteorology, 1893; Elementary Meteorology for Schools and Colleges, 1896; and numerous scientific memoirs, reports on industrial education, and articles on popular science.—*H. E. Williams.*

PRINCIPAL METEOROLOGICAL WRITINGS OF FRANK WALDO.

Mathematical lectures at Fort Myer. Ann. Rep. Chief Signal Officer, Washington, 1882. Part 1, Appendix No. 6, pp. 143–172.
Reprint of "Motions of fluids and solids on the earth's surface," by Wm. Ferrel. With notes by Frank Waldo. Prof. papers U. S. Signal Service. No. 8. Washington, 1882. 51 p.
On Mr. Heath's criticism of Ferrel's theory of atmospheric currents. Phil. Mag., London, vol. 16, 1883. pp. 264–267.
Study of meteorology in the higher schools of Germany, Switzerland, and Austria. U. S. Signal Service notes, No. 8. Washington, 1883. 9 p.
Application of Wright's apparatus for distilling to the filling of barometer tubes. Amer. J. Sc., New Haven, v. 27, 1884. pp. 18–19.
Russian meteorological service. Science, New York, v. 3, 1884. pp. 117–121.
Comparisons of Signal Service barometers with standard barometers in Europe and the United States. U. S. MONTHLY WEATHER REVIEW, Apr., 1887. pp. 119–121.
Results of Anemometer observations at sea. U. S. MONTHLY WEATHER REVIEW, Jan., 1887. p. 31.
Notes on meteorological observations in Europe. Fort Myer lectures, Jan., 1887. MSS. 87 p.
Mittlere Windgeschwindigkeiten in den Vereinigten Staaten. Met'l. Zeitschrift, Berlin, v. 5, 1888. pp. 285–296.
Translation of Wilhelm Schoch's "Representation of the mean yearly temperature of a place as a function of its general longitude." Ann Arbor. 1891. 22 p.
Modern Meteorology: an outline of the growth and present condition of some of its phases. London. 1893. xxiii, 460 p.
Wind as motive power in the United States. Review of Reviews, N. Y., v. 12, Sept., 1895.
Elementary meteorology for high schools and colleges. N. Y., 1896. 373 p.
Importance of the Mount Weather Observatory. Boston Evening Transcript, August 19, 1905.

—*C. F. Talman.*

THE RETIREMENT OF SIR NAPIER SHAW.

[Reprinted from Nature, Apr. 1, 1920, pp. 144–145.]

The impending retirement of Sir Napier Shaw, who has been Director of the Meteorological Office since 1905, and as president of the International Meteorological Committee, occupies a unique position, marks an epoch in the history of British meteorology. Trained primarily as a physicist, Sir Napier has been able to approach meteorological problems in a scientific spirit. His academic experience brought him into contact with younger men, and by the encouragement he extended to them he raised the level of his subject. As a consequence, there are at the present moment a greater number of men in the British Empire capable of dealing with intricate meteorological problems than in any other part of the world. A heavy responsibility rests on the authorities on whom the duty of nominating Sir Napier's successor falls. When the Meteorological Office was taken over by the Air Ministry last year the change was looked upon with grave misgivings. The near future will show whether the anxiety then felt then regarding the wisdom of a step that was taken against the advice of all competent authorities is to be relieved or intensified. It would be an irretrievable calamity if administrative rather than scientific qualifications were to determine the choice. Unless the whole future of British meteorology is to be jeopardized, the Director of the Office must be a man of high scientific standing who will maintain the leading place which the Office now takes among the nations of the world. For the credit of the nation and in the interests of science we trust that the new Director will be a worthy successor of the one who has given so much scientific honor to the post.

RETIREMENT OF H. HARRIES.

[Reprinted from Monthly Meteorological Charts of the North Atlantic Ocean, June, 1920.]

Mr. H. Harries retired on 31st of March, 1920, after 45 years' service at the Meteorological Office.

Serving first under Capt. Toynbee, then under Capt. Campbell Hepworth, Mr. Harries eventually took charge of the Marine Division at the latter officer's death in February, 1919, and so had the unique experience of being the only landsman who has ever acted as Marine Superintendent at the Meteorological Office.

He realized that to deal successfully with the many problems connected with marine meteorology, it was desirable to have first-hand experience and knowledge of the sea, and to understand sailors. With this in view he made several voyages across the Atlantic and to the Mediterranean. He was for a time transferred to the Forecast Division in order that practical knowledge of Atlantic meteorology should be used in forecasting.

Amongst the work done by Mr. Harries, which is of special interest to seamen, was the drawing of the Monthly North Atlantic Meteorological Charts during the first two years of their issue. He designed and prepared maps of hourly tidal streams round the British Isles, which were first published by the Admiralty in the form of a pocket atlas.

Mr. Harries has recently contributed a series of articles on North Atlantic synoptic meteorology on the October, 1919, to January, 1920, Monthly North Atlantic Meteorological Charts, and just before retiring prepared an article on cyclones of the Arabian Sea and Bay of Bengal, in which he shows how the seaman may be misled by following the usual rules which are applicable to these storms in other parts of the Tropics; May, 1920, Indian Ocean Chart.

THE METEOROLOGICAL MAGAZINE.

[Reprinted from Nature (London), Mar. 18, 1920, p. 83.]

The Meteorological Magazine, an official publication of the Meteorological Office, was first issued under its new title about the middle of February. The journal incorporates Symons's Meteorological Magazine and the Meteorological Office Circular. For convenience in reference, the serial numbers of Symons's Meteorological Maga-

zine are being carried on. The change has come about through the absorption of the British Rainfall Organization in the Meteorological Office. The cover of the new publication gives the portraits of four pioneers of meteorology, all of whom were associated with the Meteorological Office. Of these Admiral FitzRoy had charge of the Office at its initiation, when it was a branch of the Board of Trade, and Mr. Symons was an assistant 60 years ago, but left after a short period and devoted himself to the collection of rainfall returns, from which evolved later the British Rainfall Organization. Gens. Sabine and Strachey were, successively, chairmen of the Meteorological Office when controlled by the Royal Society. Little change has been introduced into the style and character of the publication, and it is evidently not intended to make any radical alteration. In addition to the interesting article on "Weather in the British Isles" for the preceding month, which has hitherto regularly appeared in Symons's Meteorological Magazine, an article is now given on "Weather Abroad" which will doubtless be valued by readers of the journal.

DIFFUSION OF LIGHT BY RAIN, CLOUD, OR FOG.

By A. MALLOCK.

[Abstracted from Proceedings of the Royal Society, ser. A, vol. 96, pp. 267-272.]

This paper considers the diffusion of light by particles whose linear dimensions are large relative to the wave length of light. If a source of light is placed within an indefinitely extended cloud which is composed of perfectly transparent small spheres, there is a certain distance beyond which none of the direct rays from the source is received. In this case each drop acts as a separate source of light and diffuses such light as it receives uniformly in all directions. The author defines his "proof plane" as the brightness of a perfectly white plane surface which could be substituted, at the same distance, for the plane in which the perfectly transparent spherical drops are located; for, "since the total quantity of light passing through every spherical surface about the source is constant, it is clear that the illumination will vary inversely as the square of the distance from the source."

It is pointed out that the difficulty of seeing things through a stratum of cloud is not due to loss of definition, but to diffusion and the consequent lack of contrasts between light and shade. This is shown by the perfect definition of the sun through a layer of cloud which really cuts down the light to a great degree by diffusion.

A table is prepared showing the effect of a shower or cloud layer in diffusing the light from a distant source. The following terms were tabulated:

c, the diameter of the drop.

n, the number of drops in a volume a^3 required to diminish by one-half the directly transmitted light.

l, the length of a column of the cloud of section a^2 which contains n drops.

N, the number of drops per unit volume of the clouds.

D, the average distance between drops.

This table was calculated on the basis of the water content in volume a^3 of the cloud being 1/100,000, which at first was thought to be a reasonable estimate. From the results of the table and certain studies in the rate of rainfall, it is believed that this value has been overestimated and that, in the case of falling rain, the volume of water can not form anything like 1/100,000 of the total volume.

TABLE 1.

c.	n.	l.	N.	D.
Inches.		*Inches.*		*Inches.*
0.1	100	10,000	0.01	4.6
.08	164	8,000	.0204	3.65
.06	285	6,000	.0475	2.71
.05	400	5,000	.080	2.32
.04	625	4,000	.156	1.82
.02	3,500	2,000	1.25	1.045
.01	10,000	1,000	10	.483
.008	16,400	800	20.5	.365
.006	28,500	600	47.5	.275
.005	40,000	500	80	.232
.004	62,500	400	366	.140
.002	250,000	200	1,250	.092
.001	1,000,000	100	10,000	.022

"The case is rather different for fog and mist * * *, but even when a fog is so dense as to make a street lamp only just visible at a distance of 10 feet (the densest white fog in my experience) it will be found that either the drops must have been much less than a thousandth of an inch in diameter or that Q [the volume of water content] much less than 10^{-5}." The "proof plane" referred to above was used in calculating l in the table.—*C. L. M.*

Discussion.—It may be of interest in connection with the above abstract to give the size of the drop to be found in various kinds of precipitation. Further data on this question was published in the MONTHLY WEATHER REVIEW, October 1, 1919, page 722. Adopting the same general classification of type of precipitation as is presented in that note, the diameters of the drops average about as follows: Fog, 0.01 mm.; mist, 0.1 mm.; drizzle, 0.2 mm.; light rain, 0.45 mm.; moderate rain, 1.0 mm.; heavy rain, 1.5 mm.; excessive rain, 2.1 mm.; cloudburst, 3.0 mm. to 5.0 mm. These values show the correctness of the author's conclusion in spite of the fact that he was not familiar with these computations.—*W. J. Humphreys.*

LIGHT SCATTERING BY AIR AND THE BLUE COLOR OF THE SKY.

By R. W. WOOD, Professor of Experimental Physics, Johns Hopkins University.

[Author's summary.] [1]

1. The intensity of the light scattered by a given thickness of dust-free air in a tube illuminated by concentrated sunlight has been compared photometrically with the light of the sky by reducing the intensity of the latter until a match was secured. The ratio of the two intensities was compared with the calculated ratio, making certain assumptions in the case of the light of the sky and a fair agreement found.

2. The intensity of the light scattered by dust-free air nearly in the direction of the incident light has been examined and found to be not very different from the intensity scattered in a perpendicular direction. It is theoretically twice as bright, but the conditions of the experiment did not permit of the determination of a difference of this amount. This indicates that the enormous increase in the intensity of the sky close to the sun's limb (over twentyfold) results from diffraction by motes in the air, and would be wholly absent if the atmosphere were perfectly clean.

3. The scattering power of the air near the ground on the clearest days in the country has been found to be about 2.6 times the average scattering power of the atmosphere.

[1] Reprinted from the London, Edinburgh, and Dublin Phil. Mag., London, April, 1920, sixth series, vol. 39, No. 232, p. 433.